

06-NOV-09  
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GEORGIA DEPARTMENT OF TRANSPORTATION  
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN  
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM  
REVISED: JUNE 30, 2008  
32' CURB-CURB; 4 BEAMS; 200' SPAN; 70' TALL; BRIDGE 7 ; PIER 7

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP				
OPTIONS											EC KSI	ES KSI	STRAIN	FACT	MAIN SIZE	STR TOP	MAX	MAX	MIN	MIN	TOP	MIN	DEPTH	BOT
D D D L	2	1	6	0-00-00		3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	19	19	11	2	2.00	4.00	3.00	2.00

COLUMN	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL	WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	ALL.PILE	I
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	P
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	15.38	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999	

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	17.625	4.000	4.000	7.000	7.000	6.000	13.625	14.000	9.333	0.667					

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	0	V	T		70.000	8.000	8.000	7.000	11.000	7.000	8.000	0.000	8	7	11	11	7	11	22	19	11	31	19	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	13.000	13.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND												* WIND ON PIER								
SUPERSTRUCTURE AREA*STD.												* WIND ON PIER								
TRANS.	LONG.	WIND	FT1	FL1	WIND	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	APT	APL	APT	APL	APT	APL	
2250.	4500.	1	50	0	44	6	41	12	33	16	17	19	8.125	8.125	10.356	20.354				

GROUP III WIND												* WIND ON LL ARMS														
STD. * WIND ON SUPERSTRUCTURE INTENSITIES												* WIND ON LL ARMS														
WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	LENGTHS	OF LL	* WIND	ON LL	ARMS
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	200.0	400.0	17.084	17.084	

MISCELLANEOUS FORCES											
CENTRI.	TRACTION	FORCE	AND	ARMS	EXPANSION	SHRINKAGE	STREAM	FLOW			
FT	FL	APT	APL	COEFFICIENT	COEFFICIENT	PT	PL				
16.232	13.700	17.084	17.084	0.00018000	0.00044000	0.000	0.000				

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	486.290	758.310	0.000	0.000	563.090	616.000						
LL01	1	28.400	83.490	0.000	0.000	76.940	154.510						
LL02	1	120.240	124.020	0.000	0.000	71.830	35.860						
LL03	2	35.760	122.500	0.000	0.000	128.790	190.370						
LL04	2	39.220	133.760	0.000	0.000	148.770	165.280						
LL05	2	122.820	207.510	0.000	0.000	133.900	50.600						
LL06	2	148.640	204.410	0.000	0.000	132.250	51.270						

COLUMN MOMENTS(KIP- FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE												* LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF		
UNIT F.AT CL.CAP	1	0.000	-8.000	1.000	70.000	0.000	0.000	0.000	8.000	1.000	70.000	70.000		
DEAD LOAD TOTAL	1	2707.978	904.849	0.000	-904.849	3326.427	11416.436	-12321.284	0.000	0.000	0.000	0.000		
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-343.651	-13.700	-1193.051	-1193.051		
CENT. FORCE 1 LN	1	0.000	-407.163	16.232	1413.547	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
WIND ON SUBSTR.	1	0.000	-82.848	10.356	724.920	0.000	0.000	0.000	-162.832	-20.354	-1424.780	-1424.780		
GROUP 2 WIND 1 1	1	0.000	-1896.911	122.856	9513.982	0.000	0.000	0.000	-162.832	-20.354	-1424.780	-1424.780		
GROUP 2 WIND 1 2	1	0.000	-1896.911	122.856	9513.982	0.000	0.000	0.000	162.832	20.354	1424.780	1424.780		
GROUP 2 WIND 2 1	1	0.000	-1679.223	109.356	8459.295	0.000	0.000	0.000	-598.207	-47.354	-3534.155	-3534.155		
GROUP 2 WIND 2 2	1	0.000	-1679.223	109.356	8459.295	0.000	0.000	0.000	598.207	47.354	3534.155	3534.155		
GROUP 2 WIND 3 1	1	0.000	-1570.379	102.606	7931.951	0.000	0.000	0.000	-1033.582	-74.354	-5643.530	-5643.530		
GROUP 2 WIND 3 2	1	0.000	-1570.379	102.606	7931.951	0.000	0.000	0.000	1033.582	74.354	5643.530	5643.530		
GROUP 2 WIND 4 1	1	0.000	-1280.129	84.606	6525.701	0.000	0.000	0.000	-1323.832	-92.354	-7049.780	-7049.780		
GROUP 2 WIND 4 2	1	0.000	-1280.129	84.606	6525.701	0.000	0.000	0.000	1323.832	92.354	7049.780	7049.780		
GROUP 2 WIND 5 1	1	0.000	-699.629	48.606	3713.201	0.000	0.000	0.000	-1541.520	-105.854	-8104.468	-8104.468		

PIER-32-4-200-70.OUT													
GROUP 2 WIND 5 2 1	0.000	-699.629	48.606	3713.201	0.000	0.000	0.000	1541.520	105.854	8104.468	8104.468		
GROUP 3 WIND 1 1 1	0.000	-1070.753	56.857	4595.875	0.000	0.000	0.000	-48.850	-6.106	-427.434	-427.434		
GROUP 3 WIND 1 2 1	0.000	-1070.753	56.857	4595.875	0.000	0.000	0.000	48.850	6.106	427.434	427.434		
GROUP 3 WIND 2 1 1	0.000	-945.245	50.407	4070.467	0.000	0.000	0.000	-299.865	-19.006	-1478.250	-1478.250		
GROUP 3 WIND 2 2 1	0.000	-945.245	50.407	4070.467	0.000	0.000	0.000	299.865	19.006	1478.250	1478.250		
GROUP 3 WIND 3 1 1	0.000	-882.491	47.182	3807.763	0.000	0.000	0.000	-550.881	-31.906	-2529.065	-2529.065		
GROUP 3 WIND 3 2 1	0.000	-882.491	47.182	3807.763	0.000	0.000	0.000	550.881	31.906	2529.065	2529.065		
GROUP 3 WIND 4 1 1	0.000	-715.148	38.582	3107.219	0.000	0.000	0.000	-718.225	-40.506	-3229.609	-3229.609		
GROUP 3 WIND 4 2 1	0.000	-715.148	38.582	3107.219	0.000	0.000	0.000	718.225	40.506	3229.609	3229.609		
GROUP 3 WIND 5 1 1	0.000	-380.460	21.382	1706.131	0.000	0.000	0.000	-843.733	-46.956	-3755.017	-3755.017		
GROUP 3 WIND 5 2 1	0.000	-380.460	21.382	1706.131	0.000	0.000	0.000	843.733	46.956	3755.017	3755.017		
LIVE LOAD LL01	1	343.340	1734.971	0.000	-1734.971	343.340	787.248	-2522.219	0.000	0.000	0.000	0.000	

COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

LOAD	COL	TRANSVERSE							LONGITUDINAL				
		PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF	
LIVE LOAD LL02	1	351.950	-1424.891	0.000	1424.891	351.950	2262.161	-837.271	0.000	0.000	0.000	0.000	
LIVE LOAD LL03	1	477.420	2193.895	0.000	-2193.895	477.420	1072.347	-3266.243	0.000	0.000	0.000	0.000	
LIVE LOAD LL04	1	487.030	1834.892	0.000	-1834.892	487.030	1173.338	-3008.229	0.000	0.000	0.000	0.000	
LIVE LOAD LL05	1	514.830	-1354.618	0.000	1354.618	514.830	2687.929	-1333.311	0.000	0.000	0.000	0.000	
LIVE LOAD LL06	1	536.570	-1699.951	0.000	1699.951	536.570	3034.941	-1334.991	0.000	0.000	0.000	0.000	

CAP ANALYSIS AND DESIGN DATA

CAP MOMENTS AND SHEARS

POINT	MOMENTS(KIP-FEET)							SHEARS(KIPS)						
	D.L.TOT.	G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT	
P 1	-40.646	-40.646	-40.646	-40.646	-40.646	-40.646	-40.646	-23.742	-655.919	-23.742	-655.919	-23.742	-978.616	
P 2	-6576.479	-6576.479	-9588.215	-6576.479	-6576.479	-6576.479	-8379.913	-753.393	-1739.196	-753.393	-1739.196	-1076.090	-2505.667	
P 3	-7739.500	-7739.500	-11262.471	-7739.500	-7739.500	-7739.500	-9849.063	-1748.167	-1748.167	-1748.167	-1748.167	-2514.638	-2514.638	
C 1L	-14841.365	-14841.365	-21430.223	-14841.365	-14841.365	-14841.365	-18786.789	-1802.767		-1802.767		-2569.238		
C 1R	-16017.669	-16017.669	-23108.682	-16017.669	-16017.669	-16017.669	-20263.785		1717.604		2410.500		1717.604	
P 4	-9256.453	-9256.453	-13575.881	-9256.453	-9256.453	-9256.453	-11842.938	1663.004	1663.004	2355.900	2355.900	1663.004	1663.004	
P 5	-8150.237	-8150.237	-12007.503	-8150.237	-8150.237	-8150.237	-10459.977	1654.033	922.016	2346.929	1335.309	1654.033	922.016	
P 6	-40.646	-40.646	-40.646	-40.646	-40.646	-40.646	-40.646	824.542	23.742	1237.835	23.742	824.542	23.742	

PT.	UNF.		TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA		RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	M+ K-FT.	M- K-FT.	AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN BAR&SPAC	M.SP.	AV/IN BAR&SPAC					
P 1	-31.266	-31.266	3.12	2 # 11	3.12	2 # 11	0.00	0.000 #5@ 0.00	24.00	0.135 #5@ 4.59	67.15		0.06	0.000	0.112
P 2	-5058.830	-6446.087	19.21	13 # 11	3.12	2 # 11	24.00	0.070 #5@ 8.86	24.00	0.269D#5@ 4.62	116.47		0.22	0.546	1.098
P 3	-5953.461	-7576.203	21.92	15 # 11	3.12	2 # 11	24.00	0.257D#5@ 4.83	24.00	0.257D#5@ 4.83	120.00		0.24	0.535	1.037
C 1-	-11416.436	-15587.527	46.24	30 # 11	3.12	2 # 11	24.00	0.268D#5@ 4.63	24.00	0.241D#5@ 5.14	120.00		0.51	0.700	0.958
P 4	-7120.349	-9109.952	26.53	18 # 11	3.12	2 # 11	24.00	0.230D#5@ 5.38	24.00	0.230D#5@ 5.38	120.00		0.29	0.551	0.983
P 5	-6269.413	-8046.136	24.16	16 # 11	3.12	2 # 11	24.00	0.241D#5@ 5.14	24.00	0.070 #5@ 8.86	116.47		0.28	0.576	1.045
P 6	-31.266	-31.266	3.12	2 # 11	3.12	2 # 11	24.00	0.215D#5@ 5.78	0.00	0.000 #5@ 0.00	67.15		0.06	0.000	0.112

NOTE: \*\*\* FS/FZ RATIO EXCEEDS 1.0! \*\*\*

COLUMN ANALYSIS AND DESIGN OUTPUT

CN	T	CRITICAL COLUMN LOADS																	
		B GR	LLC	WC R	E S	C F	S F	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T	1	LL03	0.0		C		4556.8	4880.6	0.0	4556.8	6927.1	5283.2	9857.1	14986.1	11429.6	2.163	84.00	96.00
1	B	2		5.1	R			4324.4	-6003.510535.8	4324.4	7833.6	15345.3	6941.0	12589.6	24661.9	1.607	84.00	132.00	

CN	T	COLUMN DESIGN DATA															
		B FACE 1 NO. SIZE	B FACE 2 NO. SIZE	D FACE 3 NO. SIZE	D FACE 4 NO. SIZE	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC	
1	T	18 # 11	18 # 11	8 # 11	8 # 11	81.12	1.006	1.00	0.380	4959.	16785.	1.419	1.656	1.000	2	0.70	
1	B	19 # 11	19 # 11	17 # 11	17 # 11	112.32	1.013	1.00	0.380	3922.	16789.	1.305	1.456	1.000	2	0.70	

FOOTING 1 DESIGN LOADS

F G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
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PIER-32-4-200-70.OUT													
1	2	3.1R	3326.427-8836.800-102.606	5643.530	74.354	157.383	73.174	209.423	293.631	274.876	45.909	58.628	MAX.P1
1	2	1.1R	4324.355*****-159.713	1852.214	26.460	147.807	120.012	329.040	356.835	376.418	62.809	76.216	MAX.MT
1	2	1.1R	4324.355*****-159.713	1852.214	26.460	147.807	120.012	329.040	356.835	376.418	62.809	76.216	MAX.VT
1	2	1.1R	4324.355*****-159.713	1852.214	26.460	147.807	120.012	329.040	356.835	376.418	62.809	76.216	MAX.VP
1	2	5.1R	4324.355-6003.464	-63.18810535.808	137.610	270.959	113.844	205.887	363.003	557.173	54.795	76.216	MAX.ML
1	2	5.1R	4324.355-6003.464	-63.18810535.808	137.610	270.959	113.844	205.887	363.003	557.173	54.795	76.216	MAX.VL
1	5	3.1R E	3326.427-8836.800-102.606	5643.530	74.354	157.383	73.174	209.423	293.631	274.876	45.909	58.628	MAX.P3

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE			* BAR REINFORCEMENT STEEL *						SECTION CAPACITIES *			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
25.500	25.500	5.500	1.000	1.76	29 #11	@10.500	TOP TRAN	378.373	58.998	117.997	48.885	0.000
				2.57	43 #11	@ 7.000	BOT.LONG	569.206	60.700	121.400	50.295	0.000

NUMBER OF PILES = 22 BP = 5.750 DP = 5.750